

CLAIMS

1. A cleaning solution for semiconductor substrates, which comprises an oxidizing agent, an acid and a fluorine compound, has a pH adjusted in a
5 range of 3 to 10 by addition of a basic compound and has a concentration of water of 80% by weight or greater.
2. A cleaning solution for semiconductor substrates, which comprises an oxidizing agent, an acid, a fluorine compound and a corrosion inhibitor,
10 has a pH adjusted in a range of 3 to 10 by addition of a basic compound and has a concentration of water of 80% by weight or greater.
3. A cleaning solution according to any one of Claims 1 and 2, wherein a ratio of an amount by weight of the acid to an amount by weight of the
15 oxidizing agent is in a range of 0.1 to 1,000.
4. A cleaning solution according to any one of Claims 1 to 3, wherein the oxidizing agent is hydrogen peroxide.
- 20 5. A cleaning solution according to any one of Claims 1 to 3, wherein the oxidizing agent is nitric acid.
6. A cleaning solution according to any one of Claims 1 to 5, wherein the acid is an inorganic acid.
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7. A cleaning solution according to any one of Claims 1 to 6, wherein the

inorganic acid is at least one acid selected from a group consisting of boric acid, sulfamic acid, phosphoric acid and carbonic acid.

8. A cleaning solution according to any one of Claims 1 to 6, wherein the
5 inorganic acid is sulfuric acid.

9. A cleaning solution according to any one of Claims 1 to 5, wherein the acid is an organic acid.

10 10. A cleaning solution according to any one of Claims 1 to 5 and 9, wherein the organic acid is at least one acid selected from a group consisting of oxalic acid, citric acid, propionic acid and acetic acid.

11. A cleaning solution according to any one of Claims 1 and 10, wherein
15 the fluorine compound is ammonium fluoride or tetramethylammonium fluoride.

12. A cleaning solution according to any one of Claims 1 to 11, wherein the basic compound is a strong base having no metal ions.

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13. A cleaning solution according to any one of Claims 1 to 12, wherein the strong base having no metal ions is tetramethylammonium hydroxide or trimethylhydroxyethylammonium hydroxide.

25 14. A cleaning solution according to any one of Claims 2 to 13, wherein the corrosion inhibitor is polyethyleneimine.

15. A cleaning solution according to any one of Claims 1 to 14, which further comprises a surfactant.

5 16. A cleaning solution according to Claim 15, wherein the surfactant is an anionic surfactant.

17. A cleaning solution according to Claim 16, wherein the anionic surfactant is a phosphoric ester of a polyoxyethylenealkyl ether or a
10 phosphoric ester of a polyoxyethylenealkyl aryl ether.

18. A cleaning solution according to any one of Claims 1 to 17, wherein the metal wiring comprises copper alone or a laminate structure of copper and a barrier metal.

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19. A process for cleaning semiconductor substrates having metal wiring, which comprises cleaning with a cleaning solution described in any one of Claims 1 to 18.

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